

Emerson's Ovation™ SCR Optimization Helps Constellation Energy's Brandon Shores Save \$200,000 in NOx Credits

RESULTS

- Reduced generated NOx by 250 tons
- Saved \$200,000 by eliminating the need to purchase additional NOx credits
- Eliminated 120 hours of SCR operation below 90% targeted efficiency rate of NOx reduction



APPLICATION

Two 650-megawatt B&W coal-fired boilers with General Electric steam turbine generators

CUSTOMER

Constellation Energy, Brandon Shores Station located in Baltimore, Maryland

CHALLENGE

At 1300 megawatts, Brandon Shores is the third-largest power plant in terms of owned capacity within Constellation Energy's generation profile. The Brandon Shores station operates with Selective Catalytic Reduction (SCR) systems to reduce NOx emissions during the annual ozone season from May through September. In order for the SCR to work at its target efficiency rate of 90% NOx reduction, the flue gas entering the SCR must be greater than 585 degrees Fahrenheit (°F). When the flue gas falls below 585 °F, the ammonia flow rate drops, resulting in less efficient NOx reduction. If the flue gas falls below 555 °F, SCR operation stops completely. Flue gas temperature is greatly affected by plant load. Since Brandon Shores participates in the PJM Interconnection market for regulation and is required to closely follow fluctuating load demand, the flue gas temperature frequently dropped below 585 °F and occasionally dropped below 555 °F. The original SCR control schemes were not able to optimize the flue gas temperature and struggled to maintain the minimum SCR inlet temperature. Constellation needed an optimization solution that controlled the SCR inlet temperature more tightly in order to meet the SCR efficiency target of 90 percent NOx reduction. Doing so would help the plant achieve the operational flexibility required to participate in the PJM Interconnection market.

"By automatically controlling the SCR inlet temperature, the Ovation SCR optimization application makes it possible for the plant to quickly and efficiently respond to constantly changing load demand, which is critical to our participation in the PJM Interconnection market. Emerson's technology has enabled us to dramatically increase the amount of time we operate within the optimal parameters, which, in turn, results in a significant decrease in NOx as well as a significant cost savings."

Harry Brocato

General Supervisor, Engineering Projects
Constellation Energy
Brandon Shores Station

SOLUTION

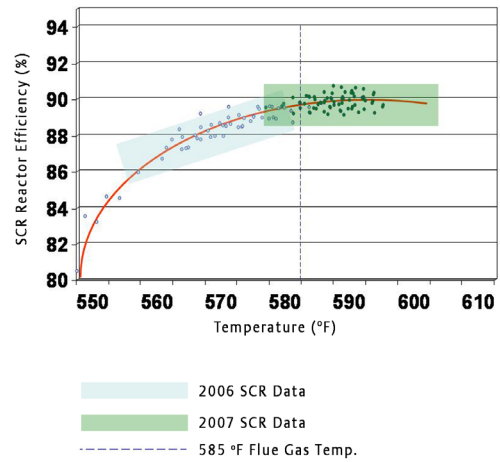
Emerson’s solution to address the Brandon Shores SCR challenges included replacing the OEM supplied design philosophy with installation of Ovation™ control strategies and the Ovation advanced SCR optimization application.

Ovation is used to control the plant’s boiler, burner management, data acquisition, and flue gas desulphurization processes. Emerson studied the original boiler and SCR designs, as well as associated operational philosophies and developed recommended changes for improvement. Several modifications were implemented in a new Ovation strategy that provided tighter management of the economizer remix temperature throughout the entire load range by revising the control aspects of the economizer bypass and outlet dampers. This resulted in more consistent control of the SCR inlet and remix temperatures.

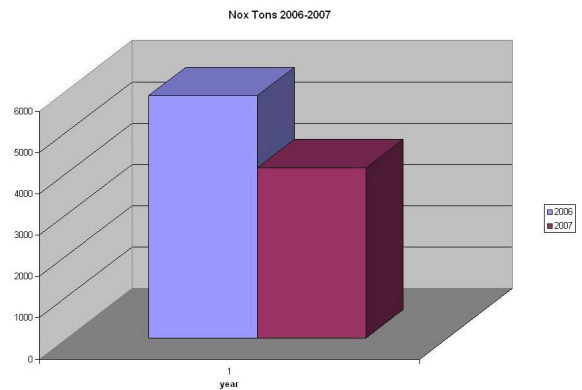
The Ovation SCR optimization application was installed to work in conjunction with the recently modified Ovation controls to further optimize the SCR inlet temperature. SCR optimization uses fuzzy logic, advanced analytics, and model predictive control to closely monitor the system and related data to predict the optimum ammonia usage and current flue gas composition. This information is then used to recommend the ideal SCR performance settings. The Ovation advanced power application also automatically calculates optimal bias settings for O₂, fans, and dampers to provide tighter control of the inlet temperature.

Since its installation in 2006, the new Ovation advanced control strategies and Ovation SCR optimization application have tightened control of the economizer remix and SCR inlet temperatures at higher loads and increased the SCR inlet temperature at lower loads. The improvement in SCR efficiency has resulted in a reduction in NOx generation, NOx credit purchases and ammonia usage, as well as extended SCR regeneration cycles.

Prior to implementing Emerson’s solutions, the tested Brandon Shores SCR operated below the targeted 90% NOx reduction efficiency rate for approximately 190 hours during the ozone season, emitting roughly 650 tons of NOx during that time. After installing new Ovation logic and SCR optimization application, test results showed that the SCR operated below the 90% target for only 70 hours, emitting 400 tons of NOx in this timeframe. By eliminating 120 hours of operation below optimal efficiency, Constellation was able to reduce the amount of NOx generated by 250 tons. At a rate of \$800 per ton, Constellation has saved \$200,000 in NOx credits.



Test results showed that the Brandon Shores SCR consistently operated above the optimum 585 °F inlet temperature using new Ovation control strategies and the Ovation advanced SCR optimization application.



EPA data shows a decrease in generated NOx tons through the entire ozone season. Data source - <http://camddataandmaps.epa.gov/gdm/index.cfm>